TEATR WIELKI
OPERA
NARODOWA

Case reference: ZP.260.___.2025

Detailed description of needs and requirements for the preparation of the "Functional and Utility Program"

for the following investment tasks:

1) Modernization of the upper and lower machinery of the Main Stage in the Theater and
2) Modernization of the upper and lower machinery of the Chamber Stage in the Theater

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August 2025

Contents

I. GENERAL INFORMATION ABOUT THE SUBJECT MATTER OF THE CONTRACT

1. Subject matter of the contract

The subject matter of the contract is the preparation of the "Functional and Utility Program ("FUP"), the purpose of which is to define the requirements and expectations of the Ordering Party with regard to the planned investment ("Investment") consisting of:

1) Modernization of the upper and lower machinery of the Main Stage at the Theater
   and
2) Modernization of the upper and lower machinery of the Chamber Stage at the Theater,
   hereinafter referred to as "Investment".

This document conceptually presents the assumptions and general scope of the planned Investment, which form the basis of, and define, the subject matter of the contract for the preparation of the FUP.

Based on the information contained in this document, the subject matter of the contract includes, among others, the preparation of analyses, opinions, and expert studies necessary to precisely define the detailed requirements that will enable the development of design and cost estimate documentation for the implementation of the above-mentioned Investment, taking into account the specific nature of the Theater's facilities and activities.

The requirements for the scope of the FUP in general include, in particular:

- **The scope of functions and performance standards**: A specification of elements that must be taken into account for the modernization, what functions they are to perform, and how they should operate after the completion of the Investment
- **Technical and quality requirements**: A specification of technologies, material standards and engineering solutions that must be used, taking into account applicable regulations and industry standards
- **Organizational background**: A presentation of requirements regarding the manner of handling the Investment, including the schedule and staging of works, and reduction of the facility's down time
- **Final results**: A definition of the expected results after completion of the Investment, such as improved functionality and safety

The Contractor is also required to perform, within the scope of this contract, works and activities which are not specified in the FUP but are essential and necessary to ensure the comprehensive implementation of the next phase of the Investment, including achievement of the assumed functionality.

The subject matter of the contract concerns conceptual and innovative solutions and, due to its complexity and high degree of sophistication (due to the conditions set by the Contracting Party), requires clarification based on negotiations. Therefore, in the second phase of the tender procedure, negotiations will be conducted with contractors concerning, among others, the scope and manner of performance of the subject matter of the contract.

2. Purpose of the contract

The purpose of the contract is to prepare a FUP that will comprehensively, in detail, and optimally define the functionality and expectations of the Contracting Party with regard to the modernization of the upper and lower machinery of the Main Stage and the Chamber Stage in the Theater building. The FUP will constitute a tender document and an appendix to the Terms of Reference for *the development of a comprehensive multi-disciplinary design and cost estimate documentation for the*

*implementation of the Investment described in point 1 above / the implementation of the Investment described in point 1 above in the "Design and Build" formula.** The FUP aims to ensure that the planned solutions comply with applicable laws, technical norms, and industry standards. The document must include an analysis of existing conditions, proposed technological solutions, performance standards, and work organization to guarantee that the intended functional and quality effects are achieved upon completion of the Investment.

* The final decision on the implementation formula will be made at the negotiation phase.

3. Description of the existing condition

1) Characteristic parameters defining the size of the Theater building:

The Theater building is a detached brick building erected between 1951 and 1965, entered in the register of heritage under number A-521 by decision of the Provincial Heritage Conservator made on 01/07/1965. The north-western part of the building is occupied by the National Theater. The building has a diverse functional and spatial layout, with a full basement with 3 underground floors under some sections. The number of above-ground floors depends on the building section. The building is divided into 3 functional blocks:

- Block "A": "Administration" with an area of 16,907.98 m2 and a volume of 49,590 m3
- Block "R": "Reception" with an area of approximately 25,870.80 m2 and a volume of 105,420 m3. This block includes, among others, the following rooms: storage, technical, museum, auditorium with foyer, **Chamber Stage**, scenography office, workshops: costume painting, upper painting and upholstery,
- Block "S": "Stage" with an area of approximately 33,360.71 m2 and a volume of 192,130 m3. This block includes, among others, the following rooms: offices, technical rooms, workshops, **Main Stage** with adjacent spaces, decoration storage, main electrical switchboard, ballet rooms, firefighting water pump room and workshops: iron, carpentry, lower painting and sculpting.

The **Main Stage**, together with adjacent spaces, is located at a level of +4.27 m above ground level. The vertical volume of the Main Stage extends through all floors of the building. The stage roof is located at a level of +47.00 m agl.

The elevation of the **Chamber Stage**, together with the auditorium, is +18.27 m agl.

2) Characteristics of existing stage technology elements / systems

Currently, the Theater uses the following stage machinery elements, which have not undergone modernization since the reconstruction of the Theater (with minor exceptions).

Illustrative list:

l.p.	Equipment	Location	Drive	Year built
1	6 stage elevators (proscenium + traps)	MS	Hydraulic	1960
2	Revolving stage		Electric	1960
3	8 stage wagons		Electric	1960
4	56 hydraulic fly bars		Hydraulic	1960
5	48 manual fly bars		Manual	1960
6	8 lighting bridges (7 lighting + 1 proscenium arch)		Electric	1960 (5 replaced in 2014)
7	Orchestra lift		Hydraulic	1960
8	17 fly bars	CS	Manual	1960

9	4 lighting bridges		Manual	1960

MS – Main Stage, CS – Chamber Stage

Detailed technical information on the existing upper and lower stage machinery is provided in Appendices 1 and 2 to this document. In Appendix 3 the Contracting Party presents animations and videos illustrating the operation of the upper and lower stage machinery of the Main Stage.

3) Technical evaluation of the existing infrastructure

a) Main Stage technology components: Approximately 95% of the Main Stage technology consists of original equipment dating back to the reconstruction of the facility in 1965, and has not been modernized since then. In its daily operations, the Theater struggles with numerous malfunctions and failures, which not always can be fully repaired. Additional difficulties include the lack of available spare parts, the time-consuming nature of the necessary maintenance work, and non-compliance with current safety standards. Therefore, the entire stage machinery needs modernization.

b) Chamber Stage technology components: The Chamber Stage technology consists of original equipment dating back to the reconstruction of the facility in 1965, and has not been modernized since then. It is fully manually operated, which significantly limits technical and artistic possibilities, requires a lot of time and work from the technical team, and hinders the flexible programming of the repertoire performed on this stage. In view of the above, the entire stage machinery needs modernization.

c) Electrical systems: Due to their technical condition, the electrical systems in almost the entire theater building need to be replaced (except for a few areas that have been modernized as part of upgrades completed to date). Currently, the building has a TN-C grounding system, with a TN-C-S system in areas covered by previous modernization. To date, the medium-voltage switchgear (label: "RG SN") has also been modernized, including two transformer units with a capacity of 2 × 630 kVA and 3 × 630 kVA, powered via two independent lines by the electricity supplier (i.e., Stoen Operator Sp. z o.o.). The structure of the low-voltage switchgear ("RG nn") is based on two sections: section 1 – "lighting" and section 2 – "power". The "power" section is equipped with switchable circuits with an automatic power reserve system ("SZR"), powered from a 125 V DC central battery in the event of external power supply failure. The modernization of the electrical systems will be carried out as a separate investment task, referred to in point 6(2) of this document. **As part of this contract, it will be necessary to determine the initial electricity demand (for the purposes of the Investment) and to define guidelines for planning the phases of the modernization of the electrical systems, taking into account the technological requirements of both investment tasks, so that they can be planned, coordinated, and implemented.**

d) Sanitary systems: The following sanitary systems are located within the Main Stage (including side stages and rear stage): ventilation, storm drainage, sanitary sewage, water supply and central heating systems, as well as water systems constituting fire protection equipment (sprinklers and firefighting water supply with fire plugs), referred to in point (e) below. **Due to their technical condition and planned functional changes, the sanitary systems of the Main Stage require modernization. Therefore, as part of the contract, it will be necessary to define design guidelines within the scope referred to in chapter II, section 1(10) of this document.** The following sanitary systems are located within the Chamber Stage: ventilation, storm drainage, sanitary sewage, water supply and central heating systems, as well as water systems constituting fire protection equipment (sprinklers, firefighting water supply with fire plugs), referred to in point (e) below. **Due to its technical condition and the inability to ensure adequate parameters on stage and in the**

auditorium during the summer and winter seasons, the ventilation system of the Chamber Stage requires modernization. Therefore, as part of the contract, it will be necessary to define design guidelines within the scope referred to in chapter II, section 2(9) of this document.

e) Fire protection systems: Over the last few years, the Theater has been implementing a phased investment project to improve fire safety throughout the building. This investment is based on an expert technical study on the fire safety situation, a multi-disciplinary design documentation for the redevelopment of the building to improve its fire safety, and building permit 663/Ś/2018 of 15/11/2018. The scope of fire protection systems located within the Main Stage and the Chamber Stage, requiring modernization / re-engineering based on the above-mentioned documents, includes in particular:

MAIN STAGE:

i. Installation of an early fire detection system: an aspiration smoke system in the Main Stage area – galleries under and over the stage;
ii. Installation of an early fire detection system in lift shafts;
iii. Installation of flame detectors in the Main Stage and rear stage areas;
iv. Installation of water curtains at lifts W13 and W14 (small and large Wertheim); (NOTE: due to the planned replacement of lifts W13 and W14, as referred to in chapter II, other solutions than water curtains may be used for separating the lifts, in accordance with applicable regulations.)
v. Modernization of the sound warning system;
vi. Expansion of the CCTV system and linking it to the Fire Detection and Alarm System;
vii. Expansion of the sprinkler system with additional sprinkler curtains in places where fire zones are closed off with non-standard elements that do not have the required fire resistance (curtains and steel gates), together with the installation of additional flow detectors enabling quick identification of the location of fire;
viii. Re-engineering of the drencher system on level +12 (technical ceiling) – replacement of drenchers with sprinklers and connection of this part of the system to the sprinkler section;
ix. Establishment of fire zones and linear equipment passages within the fire zones;
x. Re-engineering of the firefighting water supply system with fire plugs;
xi. Installation of emergency and evacuation lighting;
xii. Implementation of the fire protections for openings in fire separation walls to the required fire resistance class, including raising and ensuring the appropriate fire resistance of building elements.

CHAMBER STAGE:

i. Installation of an early fire detection system: an aspiration smoke system in the galleries of the Chamber Stage;
ii. Installation of a ventilation system for the Chamber Stage;
iii. Modernization of the sound warning system;
iv. Expansion of the CCTV system and linking it to the fire alarm system;
v. Establishment of fire zones and linear equipment passages within the fire zones;
vi. Re-engineering of the firefighting water supply system with fire plugs;
vii. Installation of emergency and evacuation lighting;
viii. Implementation of the fire protections for openings in fire separation walls to the required fire resistance class, including raising and ensuring the appropriate fire resistance of building elements.

4) The elements of the Main Stage equipment identified so far, which must be completely decommissioned include in particular:
   - rear stage elevators with a system of side barriers,
   - the drive mechanism and guides for panoramic backdrops on and under the technical ceiling,
   - unused point hoists on the technical ceiling above the stage and rear stage,
   - guides for side hoists at level +19 m,
   - crane system at level +7 m, connecting the Upper Painting Workshop with the Main Stage.
5) The Main Stage spaces contain elements of acoustic support systems and audio visual systems, which should remain in their existing locations in order to ensure their proper functionality. **The Contractor should specify guidelines in this regard in the FUP.**

4. General description of the Investment

The planned Investment will consist of the following:

1) In the Main Stage area:
   a) comprehensive modernization of the upper machinery (applies to the Main Stage, rear stage, and proscenium area), including in particular:
      - modernization of the fly bars, including replacement of the existing manual and hydraulic drives with an electric one;
      - replacement of lighting bridges, including modernization of the electrical and network systems;
   b) delivery and installation of lighting ladders;
   c) delivery and installation of outer and inner panoramic bars;
   d) delivery and installation of point hoists;
   e) comprehensive modernization of the lower machinery (applies to the Main Stage, rear stage, side stages, and orchestra pit), including in particular:
      - replacement of the revolving stage with the possibility of sinking it into the main stage area – 2 additional elevators for the "tongues" – extended (front and back) sections of the revolving stage wagon,
      - replacement of stage wagons in both side stages, including a system for sinking them to the stage level in the side stage on Wierzbowa street side,
      - replacement of stage elevators;

      (<u>NOTE</u>: The decision to retain or change the drive will be made after necessary studies, including the analysis referred to in Chapter II, section 1(1) of this document.)
   f) delivery and installation of a stage platform;
   g) installation of a crane system structure with point hoists in the side stages (left and right);
   h) replacement of the wooden floor in the stage storage / technical areas;
   i) renovation of walls, including installation of necessary storage infrastructure;
   j) installation of high-storage systems for lighting, multimedia and scenic backdrops;
   k) redevelopment of the galleries above and below the stage, including replacement of the gallery flooring with a non-flammable one and analysis of the possibility of using the space for the installation of acoustic adaptation elements;
   l) modernization of the proscenium arch bridge and proscenium arch towers;
   m) delivery and installation of a folding spring ballet floor;
   n) replacement of fabric curtains (Wagner, guillotine (soundproof) and bi-parting);
   o) replacement of iron fire curtains separating the stage from the audience, the sides stages and rear stage;

p) comprehensive modernization of the orchestra pit, including the use of acoustic adaptation elements on the walls;
q) renovation of the decorative portal around the stage window, including the use of acoustic adaptation elements;
r) adaptation of sanitary and fire protection systems to the new layout of the Main Stage;
s) adaptation of the electrical system to the new layout and functionality of the Main Stage;
t) installation of a control system with the necessary infrastructure to ensure appropriate conditions of use;
u) replacement of freight lifts – use of a vertical decoration transport system, with permissible reduction of the platform area by 10%;
v) replacement of the passenger lifts at the stage managers' stations on the Moliera and Wierzbowa sides – without changing the technical conditions (dimensions and load capacity).

2) In the Chamber Stage area:
a) complete replacement of the upper machinery, including changing the drive from manual to electric (applies to the stage and proscenium area);
b) redevelopment of the orchestra pit, including the installation of elevators in the orchestra pit;
c) installation of Harlequin Liberty Switch flooring (approx. 300 m2) with the necessary systems;
d) replacement of the wooden stage floor on the stage and proscenium;
e) renovation of the walls;
f) redevelopment of the technical galleries above and below the stage, including replacement of the gallery flooring with a non-flammable one and analysis of the possibility of using the space for the installation of acoustic adaptation elements;
g) modernization of the proscenium arch bridge and proscenium arch towers;
h) adaptation of electrical system to the new layout and functionality of the Chamber Stage;
i) adaptation of sanitary and fire protection systems to the new layout of the Chamber Stage;
j) installation of a control system with the necessary infrastructure to ensure appropriate conditions of use.

Detailed information on the Contracting Party's requirements for the individual elements referred to in points 1) and 2) above is provided in Chapter II of this document and in the descriptive and graphic part attached to this document as Appendix 4.

5. Basis for the preparation of the FUP (source materials)

In addition to other appendices referred to in this document, below is a list of documents and studies based on which the FUP should be prepared. These documents include, among others, existing documentation and other relevant materials, knowledge of which is necessary for the proper preparation of the FUP.

1) 3D scan of the Main Stage (point cloud / scatter) together with drawings of the Main Stage inventory in .DWG format (technical ceiling plan, stage plan, longitudinal sections with raised and lowered elevators, proscenium window), constituting Appendix 5 to this document
2) 3D model of the Main Stage, available at the following link: https://bimx.graphisoft.com/model/f31ff5d5-14a4-4d60-9e08-869fd739409f;
3) Expert study regarding the condition of the technical ceiling of the Main Stage, completed in December 2021, together with laser scans of the attic and technical ceiling, constituting Appendix 6 to this document
4) Technical opinions on: (1) requirements for sinking the tongues of the revolving stage and lowering (or removal) of the gallery under the stage for this reason; (2) requirements for the redevelopment of the ceiling under the side stage on Wierzbowa street side – in order to check the possibility of sinking the stage wagons; (3) requirements for the redevelopment of ceilings

above the side stages on Wierzbowa and Moliera street sides – in order to check the possibility of installing crane system with point hoists; (4) requirements for the redevelopment of the space under the orchestra pit of the Chamber Stage – in order to check the possibility of installing an orchestra pit elevator, constituting Appendix 7 to this document

5) Building inventory of the Chamber Stage, constituting Appendix 8 to this document
6) Design documentation concerning the redevelopment of the Theater building for the purpose of bringing it to compliance with fire safety regulations (covering the areas of the Main Stage and the Chamber Stage), constituting Appendix 9 to this document, including, among others:
   a) detailed design for the modernization of the existing ventilation system for the Chamber Stage – Part 12: ventilation of the Chamber Stage
   b) technical documentation of protection methods for the required fire resistance class of openings in fire separation walls, including raising and ensuring the appropriate fire resistance of building elements – Part 18: establishment of fire zones
   c) detailed design of the firefighting water supply system with indoor fire plugs 25 and 52 and valves 52 – Part 9: Fire plug system
   d) detailed design of emergency and evacuation lighting – Part 10: Emergency evacuation lighting
   e) detailed design of the warning system (sound warning system) and stage manager's communication and stage monitoring system – Part 15: Sound warning system and stage manager communication and stage monitoring system
   f) detailed design for the bringing of fixed water-based fire extinguishing systems (sprinkler and drencher systems) to compliance with the applicable fire safety regulations (excluding the "Opera" club) – Part 19: Fixed sprinkler and drencher systems
   g) detailed design for the power supply shutdown of existing ventilation circuits by the fire alarm system and protection of ventilation system ducts – Part 21.1: fire dampers
   h) detailed design for the control of newly designed fire protection devices – fire alarm system – Part 21.2: New controls
   i) detailed design of power supply for fire protection equipment – Part 21.5: Power supply for fire protection equipment
7) design for the re-engineering and extension of the lighting system for the orchestra pit on the Main Stage, prepared in December 2023, constituting Appendix 10 to this document

6. Other investments planned by the Contracting Party, which are closely related to the performance of this contract

1) Construction of a rehearsal room in the left side stage

The Contracting Party informs that, as part of a separate investment task, it plans to build a rehearsal room at the Main Stage level, in the side stage area on Moliera street side, with a footprint of approximately 17.2 x 17.0 m. This area is shown in the graphic part of Appendix 4 to this document. A detailed functional and utility program for the rehearsal room is presented in Appendix 11 to this document. The design documentation for the construction of the rehearsal room in question will be prepared by a separate entity, but the Contracting Party expects that the stage technology elements within the rehearsal room will be included in the FUP in order to be implemented as part of the design documentation prepared based on the FUP. Therefore, the Contractor undertakes to cooperate with a third party during the performance of this contract in such a way as to ensure comprehensive implementation of both investments.

2) Modernization of the electrical systems in the Theater building

The electrical system in the Theater building (with a few exceptions) has not been modernized since the Theater was rebuilt. In accordance with the information described in point 3(3)(c), the

technical condition and planned investments necessitate the planning of a comprehensive re-engineering of this system and its routes throughout the building. The scope of this documentation will include in particular:

a) building power system with switchboards,
b) lighting system with switchboards,
c) technological system with switchboards,
d) emergency lighting with switchboards (currently, as part of the investment referred to in Chapter I, point 3(3)(e), work is being carried out in selected areas of the building),
e) freight and passenger lifts,
f) equalization systems,
g) telecommunications systems,
h) building illumination systems,
i) lightning protection systems,
j) photovoltaic system,
k) power supply systems for rented premises and external connections for commercial purposes,
l) other systems necessary for the operation of the building.

It is assumed that this documentation must take into account the phasing of work, including planned investments. For the purposes of modernizing the stages and building the rehearsal room referred to in point 1) above, the following preliminary division of scope is assumed:

A. Main LV switchboard:
- Re-engineering in accordance with the new energy distribution structure
- Implementation of temporary solutions for systems in areas not renovated in phase 1
- Replacement of existing measuring systems with two-way ones

B. Main Stage with auditorium:
- building power supply system with switchboards
- lighting system with switchboards
- technological system with switchboards
- emergency lighting with switchboards
- equalization system
- telecommunications system
- other systems necessary for the operation of the building

C. Chamber Stage with auditorium:
- building power supply system with switchboards
- lighting system with switchboards
- technological system with switchboards
- emergency lighting with switchboards
- freight and passenger lift systems
- equalization system
- telecommunications system
- other systems necessary for the operation of the building

D. Construction of the rehearsal room in the left side stage:
- building power supply system with switchboards
- lighting system with switchboards
- technological system with switchboards
- emergency lighting with switchboards
- equalization system

- telecommunications system
- other systems necessary for the operation of the building

3) Modernization of the architectural lighting of the Moniuszko Hall auditorium

The investment in question consists of the design of the lighting and electrical systems for the Main Stage auditorium, together with the design of additional lighting to be installed in the auditorium staircases (step lights). The lighting fixtures currently in use are equipped with incandescent light sources, the production of which has already been discontinued. Since auditorium lighting requires smooth adjustment of intensity from the stage lighting control booth, a lighting design that incorporates modern digital protocol-controlled fixtures is essential. In addition, it is necessary to control the auditorium lighting from local consoles (locations to be determined during the contract performance phase). The purpose of this investment is to improve technical capabilities (lighting intensity adjustment, auditorium lighting programming) and highlight the architectural features of the Main Stage auditorium.

4) Modernization of the Main Stage sound and lighting control booths

The booths currently used by sound and lighting technicians at the auditorium level have not been renovated or modernized since their development, i.e., for about 60 years. The functionality of the rooms significantly deviates from current standards, failing to provide optimal acoustic parameters and posing a threat to the safety of equipment located in the rooms. The outdated electrical system does not ensure continuity of operation of the equipment during opera and ballet performances, and the ergonomics of the technicians' workstations leaves much to be desired. Investments made in recent years in the Theater in the field of sound system for the Main Stage (a digital mixing console and an acoustic support system) also need appropriate sound engineering functionality in order to fully show their potential. **In addition, the modernization of the upper and lower machinery of the Main Stage requires the design and construction of new infrastructure necessary to ensure proper functionality of sound and lighting control booths.** The modernization of the sound and lighting control booths covers both the spaces of the booths themselves and the spaces below them.

The performance of the task requires coordination with the subject matter of this contract, including guidelines covering electrical and network systems. The control system for regulated and unregulated electrical circuits (distributed around the Main Stage and the auditorium) and the source of the network system should be located in the lighting control booth. Detailed guidelines in this regard will be specified at the contract performance phase.

As part of this task, it is also planned to turn a part of the sound control booth room into a multimedia control booth room.

5) Redevelopment of the Theater building to improve its fire safety

With regard to the information contained in Chapter I, section 3(3)(e) of this document, due to the planned activities covered by the contract, as well as due to the investment planned by the Ordering Party, referred to in subsection 1 above, it is necessary to:

a) complete a new technical expert study on fire safety (taking into account the changed fire protection conditions resulting from the planned functional changes),
b) prepare substitute multi-disciplinary design documentation for the redevelopment of the Theater building to improve its fire safety, based on the new expert study referred to in point (a) above,
c) obtain a substitute building permit.

6) Implementation of a stage manager communication and stage monitoring system

Currently, the stage manager communication system operates as part of the sound warning system. As part of this investment task, it is planned to install an independent stage manager communication and monitoring system consisting of loudspeakers located within the theatre, enabling the stage manager to make calls and providing stage monitors in staff rooms, dressing rooms and buffets (Appendix 13: NTA01 stage manager call and stage monitoring system loudspeaker locations). Functional guidelines for the system:

a) Adjustment of listening volume in dressing rooms
b) Calls with automatically adjusted volume depending on noise level
c) Zone bypassing PBN rooms and rehearsal rooms. Rehearsal rooms 550 and 551 with the option of turning listening on and off, as needed
d) House calls in auditoriums and foyers

7) Redevelopment of the Chamber Stage auditorium

The aim of the investment is to increase staging possibilities and the number of seats for spectators by replacing the existing auditorium with a folding telescopic one. This solution will allow for flexible configuration of the auditorium layout and the staging of performances in different areas of the hall.

In order to assess the feasibility and functionality of this solution, the Contracting Party will commission the design of the auditorium redevelopment under a separate contract. Preliminary assumptions are that the redevelopment of the auditorium will require rearrangement of the orchestra pit. **Therefore, the Contractor will be required to study the solutions included in the concept referred to in the previous sentence and to include the resulting guidelines in the FUP.**

II. DETAILED DESCRIPTION OF REQUIREMENTS FOR FUTURE FUNCTIONALITY

1. Functional and technical requirements for the Main Stage

1) Lower and upper machinery

Detailed requirements regarding the parameters and functionality of the upper and lower stage machinery are specified in Appendix 4 to the FUP. Due to the fact that the Contracting Party has not yet made a final decision on the choice of a solution for the lower stage machinery drive system, the Contractor will be required to conduct an analysis of possible drive system variants (e.g., hydraulic, electric, electro-hydraulic) using the **SWOT** (Strengths / Weaknesses / Opportunities / Threats) method. This analysis should be carried out based on the parameters and functionalities specified in both Appendix 4 and this document and should consider the following, among others:

a) Strengths:

- Reliability and durability of the solution
- Accuracy and smoothness of movement
- Easy maintenance and servicing
- Compliance with safety standards (e.g. EN 17206)

b) Weaknesses:

- Installation and maintenance costs
- Technological complexity (e.g., the need for specialized service)
- Sensitivity to failures (e.g., hydraulic leaks, overloads)

c) Opportunities:

- Possibility of expansion or integration with modern control systems
- Increased attractiveness and functionality of the facility

d) Threats:

- Infrastructure limitations
- High electricity demand and, consequently, high energy costs
- High spare parts costs
- Problems with service or technology availability during operation

In addition, as part of the analysis, the Contractor is required to perform:

a) an assessment of the existing steel elevators structures in terms of their suitability for use (adaptation) in the new solution, regardless of the final decision on the choice of the drive system, with the replacement of the elevators plating being mandatory;
b) an assessment of the existing hydraulic system (including the machine room located on level -1) in terms of its suitability for use and adaptation (modernization) to the new solution.

2) Acoustics (construction)

The Contractor is required to conduct an analysis of the impact of stage machinery on the acoustic conditions of the stage (mechanical noise, vibrations, resonance, sound reflections), including the identification of technologies enabling quiet and smooth operation of the equipment, proposals for solutions to eliminate noise and vibrations (e.g., vibration dampers, drive silencers), and the possibility of adapting stage elements (e.g., platforms, walls) to the acoustic needs of performances (variable acoustic adaptation). The analysis in question must be based on an acoustic model and take into account the specific nature of the use of the stages for performing arts, including the requirements of artistic groups and the existing acoustic support system installed on the Main Stage (Yamaha Active Field Control 3).

In addition, the Contractor is required to:

a) prepare acoustic guidelines for the construction of floor layers in the area of the stage, elevators and orchestra pit;
b) identify requirements for noise emissions from passenger and freight lifts;
c) list requirements for the acoustic insulation of fire doors in the Main Stage area;
d) calculate the acoustic conditions on the Main Stage and select appropriate curtain solutions and possible ceiling/wall elements to improve the reverberation conditions on the Main Stage and in the Main Stage auditorium;
e) analyze sound reflection from the bridge and proscenium arch towers (in terms of artists hearing each other on stage and sound propagation to the audience);
f) determine acceptable noise levels for stage lighting equipment.

3) Stage lighting

a) The modernization of the proscenium arch bridge includes the following, among others:
   i. redevelopment of the steel structure of the bridge;
   ii. replacement of the electrical system (replacement and extension of direct and dimmable stage lighting circuits, including the appropriate network system);
   iii. modernization of follow spot stations (4 stations) together with the communication system;
   iv. preparation of suspension points for moving lights (on and under the bridge).
b) The scope of lighting bridge replacement includes the following among others: replacement of lighting bridges equipped with fixed electrical system (direct and dimmable sockets) and a network system, as well as the installation of additional movable power supplies from the ceiling to the fly bars for additional lighting.

c) The scope of modernization of stage galleries (level 11.48 m) includes the following, among others:
   i. replacement of lighting ladders structures:
      – up-down movement (retractable into the gallery structure) and along the gallery,
      – electrical systems with direct and dimmable circuits and network system,
      – ladder load capacity: 500 kg net;
   ii. preparation of structures for suspending lighting fixtures along the gallery;
   iii. redevelopment of gallery barriers to enable the installation of lighting fixtures at any point, including a marked measuring scale;
   iv. modernization of the working electrical systems (power sockets, work lights, emergency lighting);
   v. modernization of the lighting electrical system (direct and dimmable circuits) together with the network system.
d) The scope of modernization of the proscenium arch towers includes the following, among others:
   i. redevelopment of the steel structure of the towers;
   ii. modernization of the electrical lighting system (direct and dimmable circuits) together with the DMX network system;
   iii. modernization of the working electrical systems (power outlets, work lights, emergency lighting);
   iv. preparation of structures for suspending moving lights ;
   v. preparation of a structure of bars extending beyond the body of the proscenium arch towers towards the stage for suspending moving lights – a structure on three levels of both proscenium arch towers.
e) The scope of the stage level modernization includes, the following, among others:
   i. modernization of the working electrical systems (power sockets, work lights, emergency lighting);
   ii. modernization and expansion of the lighting electrical system (direct and dimmable circuits) in the stage flaps around the stage and in the rear stage area, including DMX signal sockets;
   iii. installation of covered cable trays in the floor around the stage area for the safe routing of temporary power cables;
   iv. installation of position lighting on the proscenium in the form of a retractable red light;
   v. installation of power and signal sockets on both sides of the proscenium;
   vi. installation of a stage manager's light signaling system for signaling changes to the technical team.
f) The scope of the orchestra pit modernization is defined, among others, in Appendix 4 and in the project documentation constituting Appendix 11. In addition, the scope includes the installation of a stage manager's light signaling system for the conductor.
g) The scope of modernization of the annexes / slots includes the following, among others:
   i. preparation of structures for suspending moving lights in lighting slots;
   ii. modernization of the electrical lighting system (direct and dimmable circuits) together with the DMX network system;
   iii. modernization of the working electrical systems (power sockets, work lights, emergency lighting);
   iv. installation of electrical wiring behind the crescent structures at the stage level (direct circuits) together with a DMX network system for moving lights .
h) Modernization of stage technology within the auditorium:

i. installation of structures for suspending moving lights outside the body of the auditorium balconies, at the point of contact with the proscenium (including a solution allowing for safe installation and removal of fixtures), together with an electrical system of direct circuits and a network system;
ii. installation of structures for the installation of lighting fixtures on the face of the second balcony (in the center of the auditorium) together with an electrical system of direct circuits and a network system;
iii. installation of electrical and network systems for the lighting control in order to connect the lighting console in the auditorium (in the center of the amphitheater and in the center of the ground floor).

i) The scope of ceiling modernization includes the following, among others:
   i. preparation of structures along the ceilings for suspending moving lights ;
   ii. modernization of the electrical lighting system (direct and dimmable circuits) along with the DMX network system;
   iii. modernization of the electrical system (power sockets, works lights, emergency lighting).
j) Modernization of the upper and lower dimmer rooms (a description of the current condition of the rooms, including photographic documentation and location, can be found in Appendix 12 to this document): modernization of the electrical power supply system for the Main Stage, including replacement of the control system for dimmable circuits.

4) Guidelines for controlling (automating) the machinery of the Main Stage. The Contracting Party specifies the following access points for connecting the operator console as minimum requirements:
   a) Stage level, left and right sides (points marked with numbers 02 and 03 in "Figure 1: Main Stage plan" in Appendix 4)
   b) Left and right sides of the rear stage (points marked with numbers 06 and 07 in "Figure 1: Main Stage plan" in Appendix 4)
   c) Left and right galleries (1 or 2) (points marked with numbers 04 and 05 in "Figure 1: Main Stage plan" in Appendix 4)
   d) Elevators control gallery (point marked with number 01 in "Figure 1: Main Stage plan" in Appendix 4)
   e) At least 2 operator consoles

5) The scope of multimedia modernization (audio, video, electroacoustics) includes, the following, among others:
   a) Installation of electrical and network systems for the multimedia control room (point marked with number 15 in "Figure 1: Main Stage plan") in order to enable connection of media server control in the auditorium (amphitheater) (6 x RJ45 / 1 x 230 VAC, 16 A / 8 x SM fiber optic cable) (NOTE: The separation of the multimedia control booth from the existing sound control booth is planned to be carried out in accordance with the documentation referred to in Chapter I, section 6(4) of this document.)
   b) Installation of a soundproof booth equipped with a 40,000 ANSI laser projector with hot air exhaust, located centrally under the overhang of the auditorium balcony "I" (point marked with number 14 in "Figure 1: Main Stage plan")
   c) Installation of slings equipped with a 40,000 ANSI laser projector with height setting memory, located under the projection booth on the backstage (point marked with number 13 in "Figure 1: Main Stage plan")
   d) Increasing the number of signal lines of the existing connection on the modernized proscenium arch bridge, connecting the rack cabinet located on the gallery under the stage

(point marked with number 08 in “Figure 1: Main Stage plan”), (12 x RJ45 / 1 x 230 VAC, 16 A / 1 x 32A5P / 8 x SM fiber optic cables)

e) Installation of a subtitles board mounting system with adjustable height, equipped with a subtitles board with a surface area of 1 x 12 m
f) Modernization of the multimedia infrastructure equipped with 12 connections within the stage and rear stage (points marked with numbers 01-12 in “Figure 1: Main Stage plan”), equipped with 1 x 32A5P / 3 x 230 VAC, 16 A / 8 x SM fiber optic cables / 6 x RJ45, connected to a patch panel cabinet under the acoustic booth (point marked with letters SZK M in “Figure 1: Main Stage plan”) Technical requirements for multimedia infrastructure: LAN CAT 7 cable terminated with an RJ45 socket; SM fiber optic cable terminated with an SC/UPC connector; power supply connected to a single point in the form of a switchboard with descriptions on the protections specifying which connections they protect
g) installation of mountings for the conductor’s preview, together with a network system for suspending displays, with the possibility of moving them up and down and along the gallery
h) Installation of a front sound system with speaker clusters on hoists, covering the entire auditorium with even sound

6) As part of the preparation of the FUP, the Contractor is required to develop detailed industry guidelines for the stage manager communication and stage monitoring system, to the extent necessary to produce the design documentation for the Investment. The above guidelines must take into account at least the requirements referred to in Chapter I, section 6(6), of this document.
7) As part of the stage communication system, it is planned to expand the existing system consisting of the CLEAR-COM ECLIPSE HX-DELTA matrix, V-SERIES KEYPANELS stationary devices and FREESPEAK WRILESS 1.9 GHz mobile devices. The modernization will consist of increasing the number of devices, cables and antennas, and enabling the use of the communication system outside the stage area, e.g., in storage rooms, pedestrian routes to storage rooms, and artists’ dressing rooms.
8) As part of the technical communication system, it is planned to expand the existing VHF communication based on MOTOROLA radiotelephones in order to improve coverage throughout the Theater (additional repeaters and antennas).
9) Electrical systems

   As part of the preparation of the FUP, the Contractor is required to develop detailed industry guidelines for electrical systems (power, lighting, network, etc.) to the extent necessary to produce the design documentation for the Investment. The above guidelines must take the following into account, among others:

   a) requirements for the power supply of all upper and lower machinery equipment;
   b) proposal for the layout of power supply points and main and local switchboards;
   c) division of technological, general-purpose, redundant, and emergency circuits;
   d) guidelines for integration with the following systems:
      - stage lighting,
      - multimedia and AV,
      - fire safety (fire alarm system, audible warning system, steel curtain systems);
   e) power demand balance for the Main Stage;
   f) minimum requirements for technical parameters of systems in areas with increased interference and vibration emissions;
   g) points of contact with other projects (listed in Chapter I, section 6), together with the scope of work for each set of documentation at these points of contact.

10) Sanitary systems

As part of the preparation of the FUP, the Contractor is required to develop detailed industry guidelines for sanitary systems, to the extent necessary to produce design documentation for the Investment. The above guidelines must take into account the following, among others:

a) requirements for the modernization of ventilation systems in the Main Stage area;
b) requirements for air conditioning systems in the Main Stage area;
c) parameters for heating technical areas and equipment requiring stable operating temperatures;
d) requirements for the redevelopment of sprinkler / drencher systems in accordance with applicable fire safety regulations and guidelines from a fire safety expert;
e) air humidification and heat recuperation needs;
f) proposal for the location of main service points, manholes, and access points;
g) necessary solutions for the attenuation of noise and vibration generated by HVAC equipment;
h) air balance and duct capacity analysis;
i) requirements for the firefighting water supply system with fire plugs, including fire plug types (25, 33, 52) in specific areas of the stage;
j) requirements for other sanitary systems located within the Main Stage, which will require re-engineering due to their technical condition or planned functional changes.

11) Fire protection systems

As part of the FUP, the Contractor is required to issue detailed guidelines for all fire protection systems that operate or will operate within the Main Stage, with particular emphasis on coordinating these systems with the newly designed lower and upper stage machinery and adjacent spaces, covering the areas of other documentation listed in Chapter I, section 6. The above is intended to ensure the implementation of a consistent, effective, and integrated fire protection system.

The FUP must include detailed requirements and functional and technical descriptions concerning, among others, the following systems and systems:

a) Iron fire curtains:
   - replacement of existing curtains separating the stage from the auditorium, rear stage and side stages;
   - specification of the required technical parameters (including fire resistance, closing time, automatic activation);
   - integration with fire detection and alarm systems and stage technology control systems;
   - description of the required safety zones and curtain operation logic in fire scenarios;
b) Fire detection and alarm system:
   - scope of expansion / modernization of fire detection and alarm systems in the Main Stage area,
   - integration with fire curtains, ventilation, smoke extraction, power supply,
   - proposal for the placement of detectors adapted to stage conditions (including linear detectors, spot detectors resistant to dirt and high temperatures);
c) Sound warning system:
   - indication of the locations of sound zones and types of loudspeakers;
   - integration with AV and stage sound systems (to avoid interference);
   - determination of requirements for backup power supply and redundant cable routing;
d) Fire extinguishing and water supply systems:
   - guidelines for the modernization of the existing sprinkler and drencher system;
   - indication of the required zones subject to active protection with firefighting water and division into sections;

- indication of zones requiring the use of fire extinguishing systems;

e) Control, integration, power supply:
   - determination of the principles of integration of all the above systems with the fire detection and alarm system control panel and the building management system;
   - requirements for guaranteed power supply;
   - synchronization of the logic of stage safety systems with the fire event scenario in force at the Theater;

f) Modernization of smoke hoods on the Main Stage (smoke extraction): indication of the required active smoke extraction area, minimum smoke vent area, method of activation, opening time;

g) Guidelines for the implementation of a new extinguishing system for the scenic backdrops storeroom.

In connection with the above, the FUP should include:
- functional and graphic diagrams of the fire protection systems,
- a description of recommendations regarding the location, service accessibility, and visibility of equipment,
- fire safety expert's guidelines;

12) Storage system:

a) guidelines for designing an automated high-bay storage system for lighting, audio, and multimedia equipment;

b) guidelines for designing the scenic backdrops storeroom; the final design should assume optimal use of the space in the backdrops' lift shafts in order to achieve the following storage parameters:
   - maximum use of the existing space: shaft 27.42 m x 1.1 m x 16.38 m; (Note: The Contractor must perform a technical assessment of the existing structure to evaluate its suitability for the new system.);
   - shelf dimensions: depth 50 cm, height 100 cm;
   - number of shelves depending on the proposed solution, ensuring a storage area similar to the current one (76 shelves);
   - access from levels -2, 1, and 3;

c) guidelines for storage infrastructure in decoration storerooms.

13) As part of improving logistics on stage, it is planned to optimize the use of storage space and transport of stage design elements within the building, taking into account their physical properties, the schedule of stage set changes, and all storage locations (storerooms on stage level, on other floors, and outside the theater premises). As part of the modernization, the replacement of freight lifts should be planned using a vertical stage set transport system ensuring the following parameters:

a) large Wertheim:
   - load capacity: 4 t,
   - number of stops: 7,
   - platform dimensions: 11 x 2.85 x 3.5 m,
   - maximum working height: 28.93 m;
   - access to the cabin from 2 sides;

b) small Wertheim:
   - load capacity: 2 t,
   - number of stops: 7,

- platform dimensions: 5.2 x 3 x 3.5 m,
- maximum working height: 28.93 m;
- access to the cabin from 2 sides.

14) The following is planned as part of the telecommunications systems:

a) Modernization of the telecommunications system consisting of replacing devices with a transmission speed of 1 GB with 10 GB using the existing cable routes. The modernization is aimed at receiving traffic related to stage previews in studios and offices, as well as enabling faster data exchange between graphic and AV studios.
b) Expansion of the cable infrastructure to ensure the connection of the stage action monitoring system and the communication system with the existing infrastructure.

Therefore, detailed guidelines in this regard must be included in the FUP.

15) Temporary cable routes for external transmission, taking into account the integrity of fire zones

The FUP should specify guidelines for a temporary route consisting of a channel covered by removable flaps along the wagons on Wierzbowa street side, as well as cable ducts in the walls, and suspensions enabling the temporary routing of cables for external companies and broadcast trucks or stationary connections for broadcast trucks with power supply located on the wall of the Theater or in a free-standing box at Wierzbowa street and at Teatralny Square (details to be determined in industry consultations with television stations).

16) Due to the existing problem of interference with wireless communication for controlling mobile stage sets and wireless AV and DMX transmission, the Contractor is required to perform a series of radio network measurements during rehearsals with audience members in terms of:

a) communication interference;
b) wireless video transmission;
c) communication between controllers for remote control of platforms;
d) wireless control of lighting devices.

The above is intended to generate a map of existing channels and radio frequencies used by theater systems and to choose specific frequencies for communication channels, which will help new devices operate in unoccupied frequency bands without interference in the future.

17) Replacement of passenger lifts near the stage manager's stations on Wierzbowa and Moliera street sides, maintaining the following technical parameters:

a) load capacity: 150 kg,
b) cabin dimensions: 0.7 x 0.7 m.

18) IT infrastructure – the existing infrastructure should be restored / preserved and expanded with points located in the audience area:

a) sockets (points marked with numbers 07 – backstage, 08, 09 – entrance to balcony II (new points) in "Figure 1: Main Stage plan");
b) access points (points marked with numbers 03, 04 and 05, in "Figure 1: Main Stage plan") – the positions and heights of the access points should ensure maximum signal propagation and access to the device;
c) switch (point marked with number 06 (under the stage) in "Figure 1: Main Stage plan");
d) Category 5e or higher twisted pair cable reel (points marked with numbers 01 and 02 in "Figure 1: Main Stage plan").

2. Functional and technical requirements for the Chamber Stage

1) Lower and upper machinery

   Detailed requirements regarding the parameters and functionality of the upper and lower stage machinery are included in Appendix 4 to the FUP.
   In addition, within this area, the Contractor is required to perform an expert assessment of the technical condition of the ceiling, gallery, proscenium towers, and proscenium bridge in view of the planned modernization.

2) Acoustics (construction)

   The contractor is required to conduct an analysis of the impact of stage machinery on the acoustic conditions of the stage (mechanical noise, vibrations, resonance, sound reflections), including indications of technologies enabling quiet and smooth operation of the equipment, proposals for solutions eliminating noise and vibrations (e.g., vibration dampers, drive silencers), and the possibility of adapting stage elements (e.g., platforms, walls) to the acoustic needs of performances (variable acoustic adaptation). The analysis in question must be based on an acoustic model and take into account the specific nature of the use of the Chamber Stage for performances, including the requirements of artistic groups.

   In addition, the Contractor is required to:

   a) prepare guidelines for the construction of floor layers on stage (taking into account the Harlequin Liberty Switch floor) in the area of the Chamber Stage and the orchestra pit;
   b) prepare acoustic guidelines for the orchestra pit;
   c) calculate the acoustic conditions on the Chamber Stage and select appropriate curtain solutions and possible ceiling / wall elements to improve the reverberation conditions on the Chamber Stage and in its auditorium;
   d) analyze sound reflection from the bridge and proscenium arch towers (in terms of artists hearing each other on stage and sound propagation to the audience);
   e) determine acceptable noise levels for stage lighting equipment.

3) Stage lighting

   a) Modernization of lighting bridges equipped with fixed electrical system (direct and dimmable sockets) and a network system
   b) Modernization of stage galleries, including, among others:
      i. Modernization of gallery railings to enable the installation of lighting devices at any point, with a marked measuring scale
      ii. Modernization of the working electrical systems (network sockets, works lights, emergency lighting)
      iii. Modernization of the lighting electrical systems (direct and dimmable circuits) together with the network system
   c) Modernization of stage technology within the auditorium
      i. Replacement of architectural lighting in the auditorium,
      – the ability to control the auditorium lighting from the lighting console and from local control panels,
      – modernization of step lights
      ii. Installation of a structure in the auditorium allowing for the installation of lighting fixtures under the window of the lighting control booth above the auditorium
   d) Modernization of the proscenium arch bridge and proscenium arch towers, including, among others:
      i. Replacement of electrical system (replacement and extension of direct and dimmer stage lighting circuits, including the appropriate network system)

ii. Modernization of portal barriers to enable the installation of lighting devices at any point, including a marked measuring scale

e) Modernization of the ceiling

i. Replacement of electrical systems (replacement and extension of direct and dimmable stage lighting circuits, including appropriate network systems),

ii. Modernization of piping to enable the installation of lighting fixtures at any point, including marked measuring scale

iii. Modernization of the dimmer room: modernization of the electrical power supply system for the Chamber Stage, including replacement of the control system for dimmable circuits

iv. Installation of a stage manager's light signaling system for the conductor (in the orchestra pit) and for the technical team (in the stage area)

4) Guidelines for controlling (automating) the machinery of the Chamber Stage. The Contracting Party specifies the following access points for connecting the operator console as minimum requirements:

a) Stage level, left and right sides (points marked with numbers 01 and 02 in "Figure 2: Chamber Stage plan");

b) Left and right galleries (points marked with numbers 03 and 04 in „Figure 2: Chamber Stage plan");

c) 2 operator consoles.

5) As part of multimedia (audio, video, electroacoustics) systems, the FUP should include guidelines for:

a) Installation of loudspeakers within the Theater, enabling the stage manager to make calls and providing stage monitors in the staff rooms, dressing rooms, and buffets (Appendix 13: NTA01 – loudspeaker placement zones in the stage manager communication and stage monitoring system);

b) Installation of a subtitles board mount with a subtitles board with a surface area of 0.5 x 6 m;

c) Installation of a multimedia connection located at the stage manager's station, including, among others, 12 x RJ45 / 1 x 230 VAC, 16 / 4 x SM fiber optic cables). The connection ends in the Chamber Stage amplifier room (point marked with number 01 in "Figure 2: Chamber Stage plan").

6) Stage manager system

Caption display booth located in the room (point marked with number 02 in "Figure 2: Chamber Stage plan"). With a multimedia connection containing 6 x RJ45 / 1 x 230 VAC, 16 A / 4 x SM fiber optic cables). The connection ends in the Chamber Stage amplifier room.

7) Stage communication system

As part of the stage communication system, it is planned to expand the existing system consisting of a CLEAR-COM ECLIPSE HX-DELTA matrix, stationary V-SERIES KEYPANELS devices and mobile FREESPEAK WRILESS 1.9 GHZ devices. The modernization will consist of increasing the number of devices, cables and antennas, enabling the use of the communication system outside the stage area, for example in storerooms, pedestrian routes to storerooms and artists' dressing rooms.

8) Electrical systems

As part of the preparation of the FUP, the Contractor is required to develop detailed industry guidelines for electrical systems (power, lighting, network, etc.) to the extent necessary to produce design documentation for the Investment. The above guidelines must take into account the following, among others:

a) requirements for the power supply of all upper and lower machinery equipment;
b) proposal for the distribution of power supply points and main and local switchboards;
c) division of technological, general-purpose, redundant and emergency circuits;
d) guidelines for integration with the following systems:
   - stage lighting,
   - multimedia and AV,
   - fire safety (fire alarm system, audible warning system);
e) power demand balance for the Chamber Stage;
f) determination of minimum requirements for technical parameters of systems in areas with increased interference and vibration emissions;

9) Sanitary systems

As part of the preparation of the FUP, the Contractor is required to develop detailed industry guidelines for sanitary systems, to the extent necessary to produce design documentation for the Investment. The above guidelines must take into account the following, among others:

a) Requirements for the modernization of ventilation systems in the Chamber Stage area. The current system does not provide for cooling of the supply air in summer, while air heating in winter is carried out by means of water heaters manually controlled by the air conditioning control room operators. There is no possibility of air humidification and no heat recuperation system. Therefore, a design for the modernization of the supply and exhaust systems should be carried out, taking into account the appropriate efficiency of the system and checking the capacity of the existing ventilation ducts.
b) Requirements for the air conditioning system in the Chamber Stage area
c) Parameters for heating technical areas and equipment requiring stable operating temperatures
d) Air humidification and heat recuperation needs
e) Proposal for the location of main service points, manholes, and access points
f) Indication of necessary solutions in terms of attenuation of noise and vibrations generated by HVAC equipment
g) Air balance and duct capacity analysis
h) Requirements for other sanitary systems located within the Chamber Stage area, which will require re-engineering due to their technical condition or planned functional changes.

10) Fire protection systems

As part of the preparation of the FUP, the Contractor is required to issue detailed guidelines for all fire protection systems that are or will be in operation within the Chamber Stage, with particular emphasis on coordinating these systems with the newly designed lower and upper stage machinery. The above is to ensure the implementation of a coherent, effective, and integrated fire protection system.

The FUP must include detailed requirements and functional and technical descriptions concerning, among others, the following systems and systems:

a) Fire detection and alarm system (fire alarm system):
   - scope of expansion / modernization of the fire alarm system in the Chamber Stage space,
   - proposal for the placement of detectors adapted to stage conditions (including linear detectors, spot detectors resistant to dirt and high temperatures);
b) Sound warning system:
   - indication of the locations of sound zones and types of loudspeakers,
   - integration with AV and stage sound systems (to avoid interference),
   - determination of requirements for backup power supply and redundant cable routing;

c) Fire extinguishing systems and water systems:
   - guidelines for the modernization of the existing drencher system,
   - indication of the required zones subject to active firefighting water protection and division into sections,
   - indication of zones requiring the use of fire extinguishing systems;

d) Control, integration, power supply:
   - determination of the principles of integration of all the above systems with the fire alarm control panel and building management system,
   - requirements for guaranteed power supply,
   - synchronization of the logic of stage safety systems with the fire event development scenario applicable in the Theater.

In connection with the above, the FUP should include:
   - functional and graphic diagrams of fire protection systems,
   - a description of recommendations regarding the location, service accessibility, and visibility of devices,
   - guidelines from a fire safety expert.

11) Telecommunications systems. As part of the preparation of the FUP, the Contractor is required to issue detailed guidelines for all telecommunications systems within the Chamber Stage.

III. DETAILED REQUIREMENTS FOR THE SCOPE AND FORM OF THE FUP

The FUP must be sufficiently detailed to enable the preparation of a comprehensive design and cost estimate documentation for the Investment, based on the regulations in force in Poland, including the requirements of the documents listed in Chapter V, section 3. The FUP must have separate parts dedicated to the Main Stage and the Chamber Stage, and include the following, among others:

1. Description of the design concept:

1) Layout of stage machinery devices (upper and lower), taking into account the method of their installation – on the existing structure or on an independent substructure
2) Proposals for the foundation and installation of mechanical systems

2. Detailed functional and technical characteristics:

1) Detailed functional and technical requirements for individual elements of upper and lower stage machinery equipment, including the specification of end-user requirements (functional specification)
2) Specification of technologies and industry standards for each device
3) Comparative analyses of drive systems (SWOT – electric, hydraulic, electro-hydraulic).

3. Technical studies:

1) Structural load balance and impact of modernization on the existing building structure
2) Power balance (electricity demand)
3) Assessment of the suitability of existing systems (e.g., elevators, hydraulic systems)
4) Acoustic model with analysis of the impact of new equipment on acoustics
5) Verification and update of the building inventory of the Chamber Stage, referred to in Chapter I, section 5(5), of this document
6) Preparation of an industry (installation) inventory of the Chamber Stage and Main Stage.
7) Detailed analysis of the need for specialists necessary for the proper preparation and implementation of the design documentation based on this FUP. This analysis must take into account at least the following aspects: determination of positions, roles, and responsibilities for

individual specialists, as well as determination of the minimum experience that these people should have.

4. FUP industry areas (guidelines):

1) Stage machinery (upper and lower) – Main Stage and Chamber Stage
2) Electrical, signal, sanitary, and telecommunications systems
3) Multimedia (audio-video), stage and architectural lighting
4) Security systems (fire protection system, sound warning system, fire alarm system, steel curtains)
5) Storage and transport infrastructure (e.g., cranes, brochure storage)

5. Integration with other investments:

1) Indication of points of contact between the FUP and the design documentation listed in Chapter II, section 6

6. Guidelines for control systems:

1) Determination of the distribution of access points (operator consoles, control rooms)
2) Minimum safety requirements

7. Consideration of conservation guidelines and building regulations:

1) Adaptation of solutions to the status of a historic building
2) Compliance with the regulations listed in Chapter V, section 3

8. The structure of the FUP document must include:

1) Introduction with the objectives and scope of the study
2) Description of the existing condition
3) Scope of proposed solutions (functional and technical)
4) Detailed requirements for individual areas of the Investment
5) Technical, acoustic, structural, and organizational analyses
6) Preliminary schedule (also including key milestones) with a proposal for the phasing of the Investment, taking into account the requirements of the Contracting Party (including, among others, design, necessary administrative decisions (decision of the Mazovian Provincial Heritage Conservator and building permit), tender procedures, decommissioning, construction works, assembly, acceptance (including acceptance by the Technical Inspection Authority), training).
   In order to optimize the process of modernizing stage technology elements, the Contractor is required to present proposals for phasing the implementation of the Investment. These proposals must be prepared in consultation with technical and artistic teams in order to take into account the limitations resulting from the work that can be performed during the artistic season. The Contractor is required to present a phasing plan that takes into account the optimization of the period of performance of works on and above the stages. The FUP must take into account the sequence of works, include a comprehensive schedule for the project (taking into account production times, deliveries, etc.) in order to minimize the risk of delays, and take into account the possibility of simultaneous work in different areas.
7) Identification of risks, including risk mitigation mechanisms
8) Preliminary cost estimate for the Investment, including costs broken down into individual phases resulting from the schedule referred to in subsection 6).
9) Appendices and graphic designs:
   a) Plans, cross-sections containing the concept of the layout of upper and lower machinery equipment on the Main Stage and Chamber Stage, together with the concept of their foundation (mounting on substructures directly to existing structural elements of the building or on independent structures

b) Projections, structural cross-sections with a summary of loads from upper and lower machinery equipment on the Main Stage and Chamber Stage, and an analysis of the existing structures to identify areas requiring reinforcement in connection with the new load distribution
c) Power distribution diagrams, multimedia connections, etc.

As part of the FUP, it is also necessary to define other requirements that must be taken into account to prepare the design documentation for the implementation of the Investment, aimed at achieving the set objectives.

IV. DETAILED REQUIREMENTS FOR THE CONTRACTOR'S DESIGN TEAM

The Contractor is required to provide a design team with appropriate qualifications and experience in the implementation of projects with a high degree of technical complexity, including in theatrical, historic, and technological facilities.

The design team must include at least the following specialists:

1) Design coordinator (chief designer) – the person responsible for the overall concept of the FUP, supervision of the industry team, and integration of design solutions
2) Stage technology specialist competent in lower and upper stage machinery – responsible for developing solutions in the field of stage machinery (upper and lower), with particular emphasis on modern drive systems
3) Automation and control specialist – responsible for designing control systems for technological equipment, including operator consoles and safety systems
4) Electrical systems designer (including stage lighting, power systems, and network systems) – with experience in theaters, concert halls, or entertainment venues
5) Plumbing and HVAC designer – with particular emphasis on ventilation, air conditioning, heating, and fire protection systems
6) Fire safety expert – involved in the process of determining requirements for fire protection systems
7) Building and stage acoustics specialist – responsible for analyzing the impact of technological solutions on acoustic conditions
8) Multimedia (audio-video) specialist – responsible for integrating AV systems with stage infrastructure
9) Building information modeling coordinator – responsible for developing and integrating the 3D model and interdisciplinary coordination

V. ADDITIONAL INFORMATION

1. Requirements for the preparation of the FUP

1) The Contractor is required to develop and submit to the Contracting Party a detailed schedule for the preparation of the FUP, including:
   a) scopes of individual tasks,
   b) intermediate deadlines for the completion of individual tasks (including milestones),
   c) relationships between tasks.

   The schedule will form the basis for monitoring progress and change management.
2) The Contractor is required to agree and consult with the Contracting Party on solutions, obtain the Contracting Party's written approvals for individual solutions, ensure a smooth flow of information and manage any changes to previously made decisions, taking into account their impact on other areas of the FUP.

2. Information on the method of cooperation: consultation, deliberation, approval, management of contract performance, etc.

1) The Contractor is required to actively participate in coordination meetings with the Contracting Party, which shall take place at least every 7 days (the format of the meetings will depend on the needs, i.e. in person or online). The Contractor's obligations in this regard include:
   a) organizing meetings (including coordinating dates),
   b) preparing and agreeing on the agenda,
   c) taking minutes of meetings,
   d) ensuring the circulation of documentation and archiving of agreements.
2) Participation of project team members (including the coordinating designer and key industry specialists) in meetings is mandatory, except in cases of force majeure.
3) The Contractor is required to participate in all other meetings organized by the Ordering Party in connection with the performance of the contract.
4) The Contracting Party requires that the entire FUP preparation process be supported by project management tools (e.g., Asana). This system must enable:
   a) real-time progress monitoring,
   b) identification of risks to the schedule,
   c) ongoing communication between the Contractor and the Contracting Party.

3. References to standards and norms

All solutions must comply with applicable standards and regulations, in particular:

1) PN-EN 17206:2020
2) Act of 07/07/1994 – Construction Law
3) Act of 16/04/2004 on construction products
4) Act of 12/09/2002 on standardization
5) Act of 24/08/1991 on fire protection
6) Act of 10/04/1997 – Energy Law
7) Regulation of the Minister of Infrastructure of 15/04/2022 on technical conditions to be met by buildings and their locations
8) Regulation of the Minister of Internal Affairs of 21/03/2023 on fire protection of buildings, other structures and areas
9) Regulation of the Minister of Internal Affairs and Administration of 24/07/2009 on fire water supply and fire roads
10) Regulation of the Minister of Internal Affairs and Administration of 16/06/2003 on the approval of construction designs in terms of fire protection
11) Regulation of the Minister of Labor and Social Policy on general occupational health and safety regulations
12) Regulation of the Minister of Infrastructure of 12/12/2021 on determining the methods and basis for preparing an investor's cost estimate, calculating the planned costs of design works and the planned costs of construction works specified in the functional and utility program
13) Regulation of the Minister of Development and Technology of 20/12/2021 on the detailed scope and form of design documentation, technical specifications for the execution and acceptance of construction works, and the functional and utility program
14) Regulation of the Minister of Infrastructure of 11/09/2020 on the detailed scope and form of a construction design
15) Regulation of the Minister of Internal Affairs and Administration of 07/06/2010 on fire protection of buildings, other structures, and areas

4. Requirements for durability, safety, and maintenance

Below are the minimum requirements of the Contracting Party regarding the durability, safety, and maintenance of stage machinery equipment, which should be included in the FUP as requirements for the preparation of project documentation. The Contractor is required to specify the following requirements based on technical knowledge, good practices, and applicable regulations.

1) Durability of equipment:
   a) All designed stage machinery devices must have functional parameters, taking into account intensive use in the working conditions of an opera and ballet stage.
   b) The minimum service life of the equipment (without the need to replace basic components) is at least:
      – 15 years for drive systems, mechanical structures, and suspension systems,
      – 10 years for electrical, electronic, and control components.
   c) Support structures and load-bearing elements must be resistant to corrosion, material fatigue and wear resulting from dynamic operation.
2) Safety of use:
   a) All equipment must comply with safety standards in accordance with PN-EN 17206:2020 "Stage technology – safety requirements," and in the absence thereof, other recognized industry standards (e.g., ISO, DIN).
   b) Drive systems must have overload protection, redundancy systems, and emergency stop systems.
   c) Control systems must meet at least SIL3 safety level (in accordance with IEC 62061 or EN ISO 13849-1).
   d) Continuous indication of the position and status of devices on all operator consoles is required.
   e) In the event of a power failure, devices must stop in a safe manner (e.g., self-braking, electromagnetic brakes, mechanical locks).
   f) All elements moving above the stage and audience space must be protected against uncontrolled fall or displacement.
3) Maintenance and servicing:
   a) The layout of the equipment must be designed in such a way as to allow easy access to components requiring regular maintenance and inspection.
   b) The FUP must provide for the location of service and communication points (e.g., access to drive cabinets, suspension zones, galleries).

VI. Appendices

- Appendix 1: Technical information on the Main Stage (Moniuszko Hall)
- Appendix 2: Technical information on the Chamber Stage (Młynarski Hall)
- Appendix 3: Presentation of the operation of the upper and lower machinery of the Main Stage
- Appendix 4: Technical concept of the stage machinery of the Main Stage and Chamber Stage
- Appendix 5: 3D scan of the Main Stage together with inventory drawings of the Main Stage in .DWG format
- Appendix 6: Technical structural assessment of the technical condition of the Main Stage ceiling
- Appendix 7: Technical structural opinions for the Main Stage and Chamber Stage
- Appendix 8: Building inventory of the Chamber Stage
- Appendix 9: Detailed designs for the re-engineering of the Theater building to improve its fire safety, covering the Main Stage and Chamber Stage areas
- Appendix 10: Design for the re-engineering and extension of the orchestra pit lighting system on the Main Stage

- Appendix 11: Functional and utility program for the construction of a rehearsal room in the left side stage of the Main Stage
- Appendix 12: Description, location, and illustrative photos of the transducer room
- Appendix 13: NTA01 – speaker placement zones for the stage manager communication and stage monitoring system